

## Hydrogen-Powered Dolls House



Information and Set-up guide

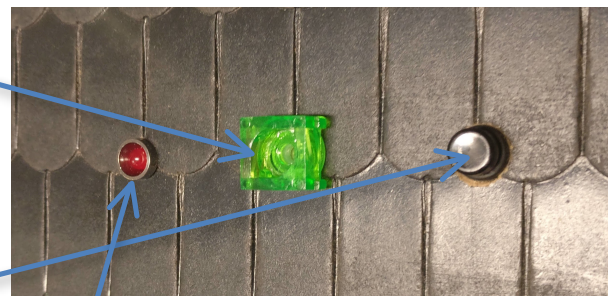


## Quick-start Guide

1. Make sure all 4 switches are in the 'off' position.



2. Attach fuel supply (balloon or hydrostik) via the **input connector** on the roof of the house.



3. Give the **purge valve** a tap (in normal operation valves open for milliseconds at a time), the shortest possible press should be more than enough to purge the fuel cells and allow them to be filled with hydrogen from your supply.

4. The **status LED** should light up, showing you that the system is charging.

5. Once the status LED turns off the system is fully charged and ready to use.

6. Switch the 'ALL' switch to on position, the individual floors can now be turned on/off with their respective switches.

#### PLEASE NOTE

Due to the way the system is designed leaving a floor on for long periods of time is likely to cause too much current draw, draining the Fuel Cell Controller's capacitors and causing all kinds of odd things to occur as the voltage drops.

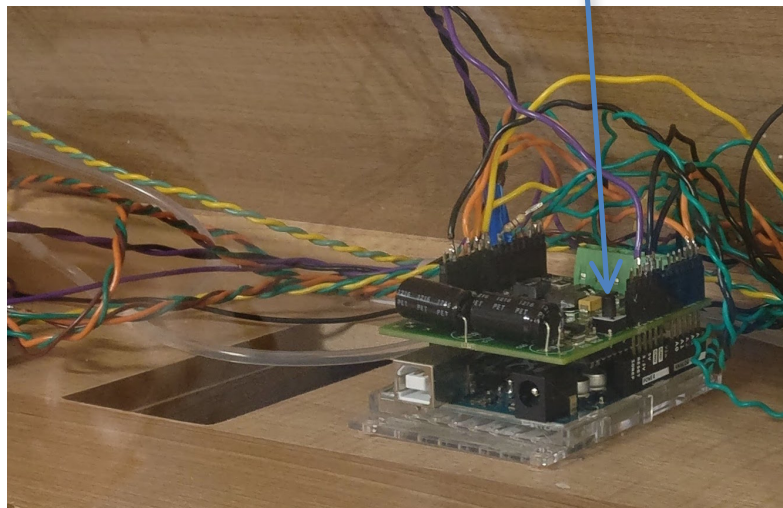
It is highly advised that –

- Testing is conducted prior to use in public to get a feel for how long each floor can run for.
- A small amount of time is left between turning on and off each floor, allowing the capacitors to recharge (particularly with regards to using floor 3).

If the voltage does drop too low you will likely begin to see LEDs flickering, servos twitching and devices turning on/off at unwanted times.

As a failsafe simply switch all 4 switches to the off position and allow to recharge. In some rare instances a hard-reset may be required, this can be done by either –

- Removing the fuel supply and allowing the system to run down completely before restarting (the old turning it off and on again method).
- Pressing the reset button on the Fuel Cell Control Board – to do this one must reach in through the middle room on floor 3, up through the hole for the staircase and over to the right, pressing the **small 'reset' button** on the top of the far-right-hand-side of the board.



## Looking after a Fuel Cell System

As electro-chemical devices both the atmosphere they are used in and how they are stored affect fuel cells. Check the following if your dolls house or RC bus have been in storage for a period of time or seem to be falling over (running out of power) more often than expected –

- Run the system under 'no-load' for a period of time – this is recommended to be done with a HydroSTIK, simply run the system without turning on any of the connected devices, this will re-humidify the fuel cells as water is produced internally, as well as allowing the controller board to current-pulse more effectively, a process that is used to clean and condition the catalytic layer. This should be done in a well ventilated area to maintain supply of fresh air to the stacks, in the case of the dolls house the 'ALL' switch can be turned on to activate the Air Supply Fan.
- Check the pressure of your fuel supply –
  - For systems running directly from a HydroSTIK this is unlikely to be a problem unless you have an empty or faulty cylinder.
  - For systems running from balloon, make sure the balloon is inflated as much as possible, if the balloon has been used several times it is highly advised to replace it, as balloons are reused they become more and more stretched out, stopping them from maintaining the pressure required for an efficient reaction.
- Switch to HydroSTIK fuel supply if using balloon.
- Use in a warm room with good airflow – Fuel cells like to be warm, they do generate their own heat over time but a great way to improve their performance is to give them a pre-heat in a warm room or even a quick blast with a hairdryer.

Manually purge – both Fuel Cell powered devices come equipped with manual purge valves, giving a system a few fast purges can often clear some impurities from the catalytic layer and any possible blockages.

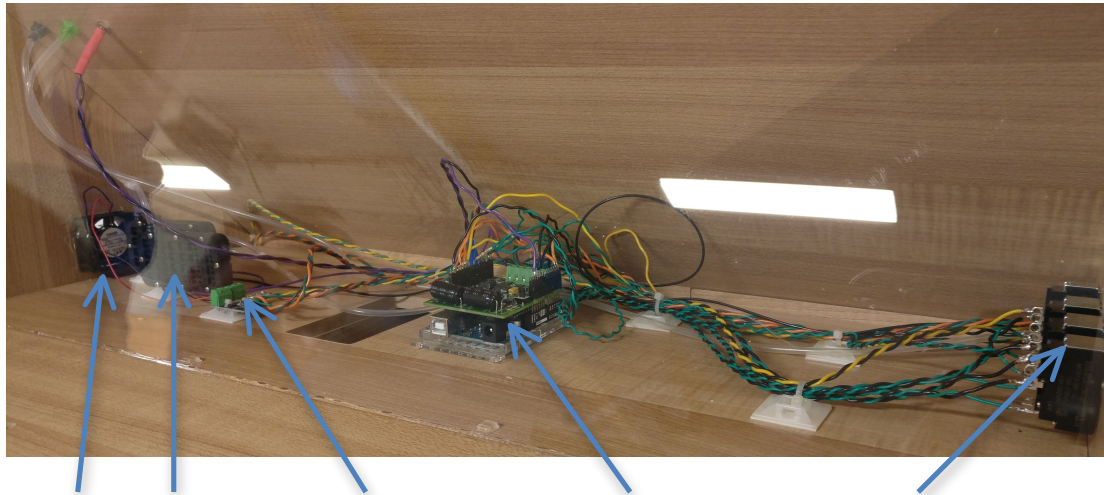
## Room by room (top to bottom)

### Floor 4 – Loft

The Loft contains all the Fuel Cell System components that power all devices inside the house.

The Fuel Cell System components are behind a sheet of Perspex to allow them to be shown to audiences.

The main components of this system are labelled on the image below:



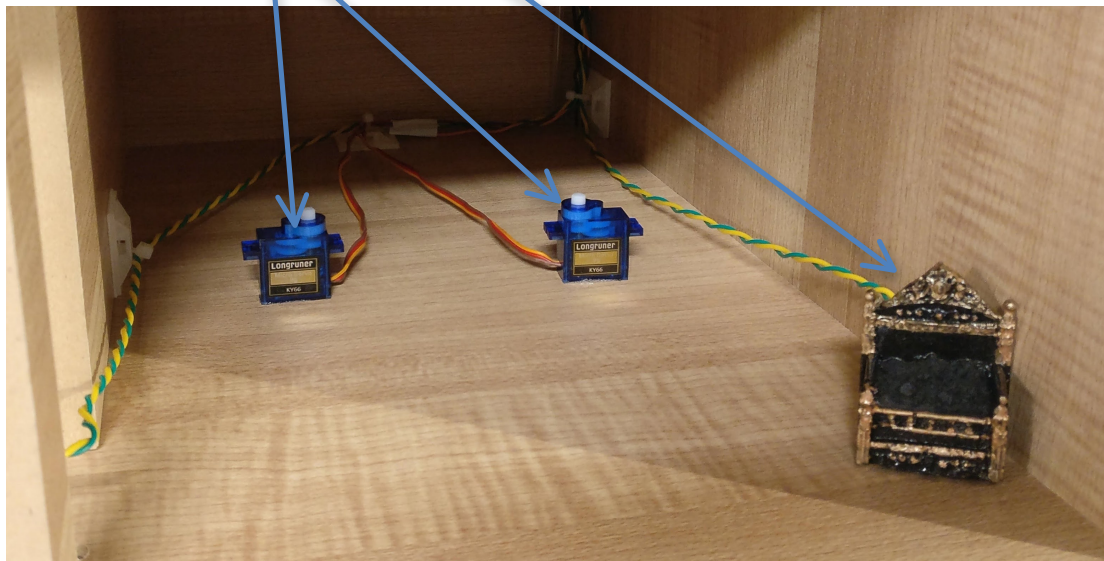
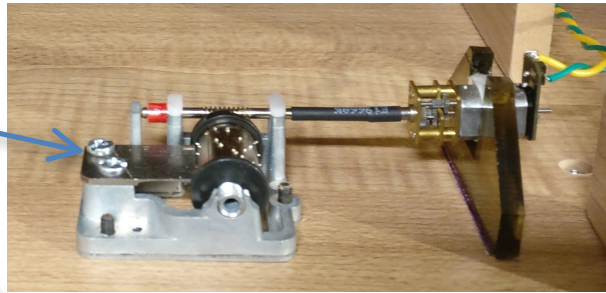
Fan - Fuel Cells - Motor Driver Board - Fuel Cell Controller - Floor Power Switches

- Fan – Ensures flow of Air to the Fuel Cells, making sure there is enough oxygen provided to the catalyst to allow for a full reaction.
- Fuel Cells – The electro-chemical device which powers everything inside the dolls house – These are 2x 2watt PEM (polymer electrolyte membrane/proton exchange membrane) fuel cells and are ‘open-cathode’ meaning they take their supply of oxygen from the atmosphere.
- Motor Driver Board – This controls on/off, speed and direction of 2 of the motor-powered devices within the house.
  - The Fuel Cell oxygen supply fan
  - The Music box
- Fuel Cell & House Controller – These boards are the brain of the house, performing a number of tasks including -
  - Regulating the fuel cell output to 5 volts.
  - Conditioning the fuel cells through periodic automatic purging and current pulsing.
  - Controlling the Motor Driver Board.
  - Controlling all LEDs.
  - Receiving on/off signals from Floor Power Switches.
- Floor Power Switches – These switches control the on/off function of internal devices floor-by-floor, there is also an additional master ‘kill-switch’ that can disconnect power to all floors when required.

### Floor 3 – Bedroom & Living-room

This floor has by far the most devices, including:

- LED lights
- Music box
- Flickering fireplace
- Dancing figures



LED lights – There is a strip of RGB (red, green and blue) LEDs across the ceiling of each room of the house (except for the loft). On this floor the LEDs flash different colours during operation (disco anyone?).

Music box – This is controlled/powered by a tiny, geared motor.

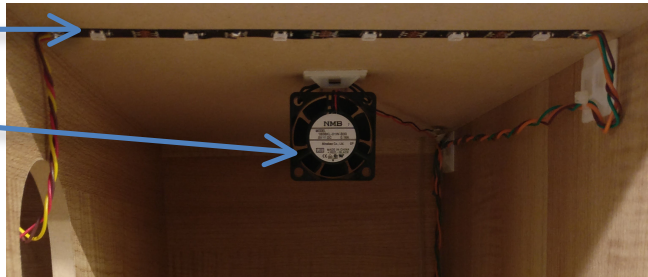
Flickering fireplace – Made to flicker by an internal LED.

Dancing figures – During operation these servos will turn from 0 degrees to 180 degrees continuously, during standby they will return to a 90 degree rest position. Cardboard figures can be glued directly to the servo arms included with the houses, allowing them to be easily swapped out and repaired if broken. Servo arms simply sit on the small white gear protruding from the top of each servo.

## Floor 2 – Kitchen & fan room

Featuring –

- LED lights
- Fan
- Light-up Cooker



### Fan Setup -

Due to the way in which the houses were shipped the final cosmetic piece of this room could not be attached. To add the finishing touch simply stick a strip of double-sided tape between the fan and LED strip, parallel to the LED strip. Using the tape as a point to attach strips of coloured paper or reflective material, creating a 'curtain' that will move when the fan is in operation (strips should be 2-5 mm wide and made from a suitably light-weight material to allow for most movement).

## Floor 1 – Bathroom & bubble room

Featuring:

- Bubbling tube
- LED lights

Bubbling tube Setup –

The bubbling tube can be found hanging down from the back, far-right corner of the right-hand room. To install the tube simply insert the end into a suitable container of water (you may wish to add some dye to the water to make bubbles easier to see). The tube will in almost all cases need to be weighted to the bottom of your container.



It is worth noting that the bubbles produced from this tube come directly from the supply of hydrogen that is fuelling the whole house and therefore should not be left on for long durations as this will deplete hydrogen supply faster than normal and cause a drop in pressure within the fuel cells themselves, leading to a slower reaction and less current being available to run the devices in the house.